AN INTENSIVE SURVEY OF THE ILLINOIS RIVER (ARKANSAS AND OKLAHOMA) IN AUGUST 1985

by

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and

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
ALLIED BANK TOWER AT FOUNTAIN PLACE
1445 ROSS AVENUE
DALLAS, TEXAS 75202

March 22, 1988

REPLY TO: 6W-QT

Mr. Lawrence R. Edmison, Director
Oklahoma Department of Pollution
Control
P.O. Box 53504
Oklahoma City, Oklahoma 73152

Dear Mr. Edmison:

I am sending you a copy of Jack Gakstatter and Al Katko's final report on the intensive survey of the Illinois River. Additional copies can be purchased through NTIS for $19.95 or $6.95 for microfiche. The NTIS accession number is PB88 117056AS; the report number is EPA/600/3-87/040. If you have any questions concerning the report, please call me at (214) 655-7145.

Sincerely,

Cheryl Overstreet
Illinois River Project Manager

Enclosure

While Lake Frances was not thermally or chemically stratified, it was eutrophic, supported phytoplankton densities ranging from 10,540-54,300 algal units/ml during the survey, contained relatively high concentrations of chlorophyll a, and was supersaturated with dissolved oxygen in late afternoon. No significant amounts of floating algal mats were present.

Turbidity from inorganic suspended particles also increased in Lake Frances, perhaps due to resuspension of sediment. Under stable flow conditions, the Lake Frances outflow was the most turbid water sampled in the Illinois River Basin.

Lower Basin

The outflow from Lake Frances adversely affects water clarity in the Illinois River for 20 miles or more below the dam. Water clarity and related water quality characteristics, such as chlorophyll a, phytoplankton density, nutrient concentrations, and total suspended solids, all improved steadily in the Illinois River below the Lake Frances dam with the greatest improvements occurring in the initial 10-20 miles. Part of the increased water clarity was from dilution of the Illinois by the extremely clear waters of Flint Creek, although substantial improvements had already occurred between Lake Frances and the confluence of the Illinois River and Flint Creek.

Decreasing chlorophyll concentrations and phytoplankton densities in the Illinois River below Lake Frances clearly indicate that phytoplankton reproduction is negligible in these flowing waters. Reductions of phosphorus and inorganic nitrogen in this reach are probably due to uptake by periphyton which were present during the survey but not in nuisance quantities.

The absence of nuisance levels of periphyton during our survey may have been due to scouring caused by higher than normal stream flows, because

Nutrients in Groundwater

In the upper Illinois River Basin, wastes from extensive confined poultry and animal production operations are disposed of by spreading them on the land, a practice that has produced excellent ground cover and pasture. These animal wastes, however, are rich in nitrogen and phosphorus and are suspected of contributing to nutrient levels in surface waters through soil percolation and direct runoff.

During the survey, eight springs were sampled in the upper IRB to determine whether significant quantities of nitrogen and phosphorus were being introduced into surface waters from groundwater. The analytical results for total phosphorus and nitrate-nitrogen are shown in Table 11 (also Appendix G). Total phosphorus concentrations in groundwater were low (0.01-0.05 mg/l) and about the same concentrations that were observed in surface waters not influenced by point source discharges. This is expected because soluble phosphorus is readily bound by soil particles. Nitrate-nitrogen concentrations ranging from 3.1-5.7 mg/l were found in five of the eight springs. These concentrations were markedly higher than those found in any surface water samples except those collected near point source discharges. These data strongly suggest that groundwater is not a transport mechanism for phosphorus in the Illinois River Basin, but does carry significant concentrations of inorganic nitrogen that very likely are related to animal waste applications.

Nursery Discharges

During the survey, grab samples were collected from the discharges of the Midwestern and Greenleaf Nurseries. Midwestern discharges directly to the Illinois River about 1.7 miles upstream from station SR 5, while the Greenleaf

comm.). This suggests that controlling algal growth in Lake Frances will result in a marked improvement in water clarity in the reservoir and in the Illinois River reach below the dam even if inorganic turbidities are unchanged.

Tenkiller Ferry Reservoir

Lake Tenkiller eventually receives much of the phosphorus and other nutrients from the Illinois River and its tributaries. Tenkiller is a eutrophic water body in which, during our survey, the phytoplankton community was dominated by bluegreen algae, Aphanizomenon flos-aquae in the upper end and Lyngbya limnetica, in the lower end. During a preliminary visit in June 1985, another bluegreen, Anacystis sp., was blooming in the upper end of the reservoir near the State Highway 100 bridge.

Water quality in Lake Tenkiller, in terms of water clarity, phytoplankton densities, and chlorophyll concentrations, improves markedly from the upper end of the reservoir to the lower end (near the dam). The dominance of bluegreen algae and the phytoplankton densities that were observed in the upper end of the lake are not characteristic of the low phosphorus concentrations that are associated with background (natural) water quality in the basin and are likely being caused by anthropogenic phosphorus inputs. Lake Tenkiller, in our opinion, could have exceptional water quality throughout and should be protected to the extent possible from excessive nutrient inputs, particularly phosphorus.

CONCLUSIONS

The following conclusions can be drawn from the Illinois River survey which was conducted August 16-29, 1985:

-- Lake Frances provides an ideal environment for algal growth and, during the survey, supported an extensive phytoplankton community dominated by the centric diatom, Cyclotella atomus.

-- Turbidity in Lake Frances was caused by a combination of inorganic suspended material and phytoplankton and this turbidity reduced water clarity in the Illinois River for 20 miles or more below the dam.

-- Comparison of secchi disc transparencies in Lake Frances during the survey to transparencies during December and January, when phytoplankton populations were minimal, suggest that a significant portion of the turbidity is caused by algae.

-- Total phosphorus concentrations in Flint Creek (carrying treated wastewater from Siloam Springs, AR) near its confluence with the Illinois river, ranged from 4 to 7 times background but were approximately the same as the Illinois River concentrations because of the influence of Osage Creek.

-- Two stream types were observed in the Illinois River Basin, extremely clear versus mildly turbid. These stream types probably reflect the surficial geology of their drainage basins, however; there was no obvious relationship between stream type and the two ecoregions (Ozark Highlands and Boston Mountains) in the basin.

-- Nuisance levels of periphyton were not observed in any flowing waters in the Illinois River Basin; however, their development may have been prevented by higher than normal stream flows.

-- Lake Tenkiller is eutrophic and very productive in its upper reaches. The phytoplankton community throughout the reservoir was dominated by species of bluegreen algae.